



Honeywell

Installation and Operation Manual

BENDIX/KING[®]

KMA 28

*FAA-Approved TSO C50c, C35d
JAA-Approved JTSO-2C35d, C50c*

*Audio Amplifier /Intercom/
Marker Beacon Receiver*

*Document P/N 006-10565-0000
REVISION 0, SEPTEMBER 2000*

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Section I GENERAL INFORMATION

1.1 INTRODUCTION

The KMA 28 represents the next step in cockpit audio control and intercommunications. Using proprietary *IntelliVox*® design, this unit eliminates the requirements for intercom squelch adjustments. The unit is designed for outstanding ergonomics and visually defined mode annunciation and selection.

Before installing and/or using this product, please read this manual completely. This will ensure that you will take full advantage of all the advanced features in the KMA 28.

1.2 SCOPE

This manual provides detailed installation and operation instructions for the Honeywell, Inc. KMA 28 Audio Selector Panel/Intercom System

<u>Model</u>	<u>Description</u>	<u>Part Number</u>
KMA 28	Stereo Audio Panel with Marker	066-01176-0101

1.3 EQUIPMENT DESCRIPTION

The KMA 28 is a state of the art audio isolation amplifier and audio selector that contains an automatic voice activated (VOX) intercom system. It can switch up to three transceivers (Com 1, Com 2 and Com 3) and six receivers (Nav 1, Nav 2, ADF, DME, MKR and AUX).

The TEL mode allows the KMA 28 to act as an audio interface between aircraft headphone and microphones and specific aircraft approved (FAA/FCC) cellular telephone equipment.

Warning: Use of non-aviation approved cellular telephone equipment may be prohibited by regulation. Honeywell, Inc. is not responsible for unauthorized airborne use of cellular telephones.

There are two unswitched inputs, for autopilot disconnect, and/or radar altimeter warning. Push buttons select the receiver audio source provided to the headphones. A SPR button allows the user to listen to the receiver(s) selected on the cabin speaker. Except for the unswitched inputs, all speaker audio is muted during transmit.

A rotary switch selects one of the three communication transceivers for the pilot and copilot position, and allows radio transmission. In "Split Mode" the KMA 28 has the ability to allow the pilot and copilot to operate different transceivers independently. The TEL mode allows the pilot to use the cellular telephone interface. External switches permit telephone operation for the copilot and passengers.

An emergency mode connects the pilot headphone and microphone to COM 1 if power is removed for any reason, or if the power switch is placed in the Off (emergency) position.

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A six-station voice activated (VOX) intercom is included in the KMA 28. This system has the advanced *IntelliVox*® circuitry that eliminates manual adjustments. The system contains six separate VOX mic circuits, and only opens the microphone channel in use.

The intercom system incorporates pilot isolate and crew modes, two stereo (or mono depending on unit) music inputs with "Soft Mute," and LED indicators for swap and transmit indications. Intercom control is through front panel-mounted knob and 3 position mode switch. A single volume controls intercom level for the pilot and copilot. Passenger headphone volume is factory set, and adjusted in flight with headset-mounted volume controls. Passenger volume control is further adjustable through screwdriver access in the top of the unit. Intercom squelch is automatic.

A 3-light Marker Beacon receiver is integrated in the KMA 28. This provides the necessary Marker Beacon lights and audio indications necessary for an Instrument Landing System (ILS) approach.

1.4 APPROVAL BASIS -

TSO Approval.

The KMA 28 Audio Selector Panel is FAA approved under TSO C50c (Audio Amplifiers) and TSO C35d (Marker Beacon Receivers). In addition, they are approved by the Joint Airworthiness Authorities under JTSA C50C and JAR-TSO 2C35d. The TSO holder and manufacturer is PS Engineering, Incorporated, Lenoir City Tenn., USA.

The KMA28 complies with relevant portions of EUROCAE RTCA MPS WG No. 7/70, DO-143 and (*Marker Beacon Receivers*), ED-14C/DO-160C (*Environmental Conditions and Test Procedures for Airborne Equipment*), ED12B/DO-178B (*Software Considerations for Airborne Equipment*) and ED- 18/DO-214 (*Audio Systems Characteristics and Minimum Operational Performance Standards for Aircraft Audio Systems*).

Operation is subject to the following conditions:

This device may not cause harmful interference.

This device must accept any interference received, including interference that may cause undesired operation.

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1.5 SPECIFICATIONS

TSO COMPLIANCE	
<i>Marker Beacon:</i>	C35d, Class A
<i>Audio Selector/Intercom:</i>	C50c, Class A
APPLICABLE DOCUMENTS:	RTCA/DO-214 RTCA/DO-143 RTCA/DO-160C RTCA/DO-178B
ENVIRONMENTAL Qualifications:	A1D1/CA(MN)XXXXXXBBBBTBKXX
<i>Temperature Range:</i>	
Operating:	-15° C to +55°C
Storage:	-55° C to +85°C
<i>Altitude:</i>	Up to 50,000 feet in a non-pressurized area of the cockpit.
DIMENSIONS:	Height: 1.3 in. (3.3 cm) Width: 6.25 in. (16.9 cm) Depth: 6.8 in. (17.3 cm)
WEIGHT (With Rack & Connectors):	1.5 lb. (0.54 kg)
POWER REQUIREMENTS (Including Internal Lighting):	
<i>Voltage:</i>	11 to 33 VDC
<i>Maximum Current:</i>	2.5 Amp (Externally protected by a 3 Amp circuit breaker.)
<i>Typical operating current:</i>	
Speaker off:	350 mA
Speaker on, 28V, full radio volume	1.5 A
Audio Selector Specifications	
<i>Audio selector panel input impedance:</i>	510 Ω
<i>Input Isolation:</i>	-60 dB (min.)
<i>Speaker Muting:</i>	-60 dB (min.)
<i>Speaker Output (into 4 Ω) with no clipping</i>	
14 VDC:	3 Watts (min.)
28 VDC:	10 Watts (min.)
<i>Receiver Inputs:</i>	9 (Com 1, Com 2, Com 3, Nav 1, Nav 2, ADF, DME, MKR, AUX)
<i>Unswitched Inputs:</i>	2 (examples: GPS WPT, Value, Autopilot Disconnect, Altimeter DH)
<i>Transmitter Selections:</i>	6 (Com 1, Com 2, Com 3 Com1/2, Com2/1, Telephone)
<i>Speaker Impedance:</i>	4 Ω
<i>Headphone Impedance:</i>	150 - 1000 Ω
<i>Headphone Output:</i>	38 mW each headset, no clipping <1% THD 70 mW each headset with < 10% THD into 150Ω
<i>Microphone Impedance:</i>	150 - 600 Ω

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Intercom Specifications	
<i>Intercom Positions:</i>	6 places (with individual <i>IntelliVOX</i> ® circuits)
<i>Music Inputs:</i>	2 (Stereo)
<i>Music Muting:</i>	>-30 dB "Soft Mute" when Com or intercom active.
<i>Distortion:</i>	<1% THD @ 38 mW into 150Ω <10% THD @ 70mW into 150 Ω
<i>Mic Freq. Response, 3 dB:</i>	300 Hz - 6000 Hz
<i>Music Freq. Response, 3 dB:</i>	100 Hz - 18kHz
MARKER BEACON RECEIVER	
<i>Frequency:</i>	75 MHz Crystal Controlled
<i>Sensitivity:</i> Low: High:	Capable of: 1000 μVolts (Hard) 200 μVolts (Hard) (preset at factory for field application)
<i>Selectivity:</i>	-6 dB at ±10 kHz -40 dB at ±120 kHz
<i>External Lamp Output:</i>	9.0 (±2.5 unloaded, at maximum brightness) VDC positive when active, max. current 125 mA
<i>MM Sense:</i>	Active high (4.7 VDC ± 0.5V) during Middle Marker acquisition, for autopilot use.

1.6 EQUIPMENT SUPPLIED

1 ea. of the following:

Model	Part Number
KMA 28	066-01176-0101

KMA 28 Installation Kit, 050-03613-0001, contains the following parts.

Description	Quantity	Part Number
KMA28 install rack	1	071-00164-0001
Top Molex Connector Shell w/key, 44 pin, key 4/5	1	120-425-4402
Bottom Molex Connector Shell w/key, 44 pin, key 7/8	1	120-425-4400
Gold Plated Crimp Pins	88	425-001-0002
4 40 X 7/16 screw w/nyl patch	4	475-440-0007
Grounding strap	1	430-007-0001
6-32 X 3/4 screw php	2	475-632-0038
6-32 Nut Flat	2	475-632-0003
6-32 Lock Nut	2	475-632-0004
Cable Clamp	1	625-001-0002
#6-32 x 1/2" FHP screw	6	475-632-0012
#6-32 Clip Nut	6	475-630-0002

The KMA 28 install rack may be purchased separately under part number 071-00164-0001.

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1.7 EQUIPMENT REQUIRED BUT NOT SUPPLIED

- a) Circuit Breaker: 1 ea. 3 amp
- b) Speaker, 4 Ω
- c) Headphone Jacks (Stereo, as Required)
- d) Microphone Jacks (as Required)
- e) Headphones, 150 Ω (Stereo), up to 6 as required
- f) Microphones, up to 6 as required
- g) Marker Antenna (75 MHz, VSWR <1:1.5, 50 ohm, and cable (RG400 R/U)
- h) Interconnect Wiring

1.8 LICENSE REQUIREMENTS

None

Section II - Installation

2.1 GENERAL INFORMATION

2.1.1 SCOPE

This section provides detailed installation and interconnect instructions for the Honeywell, Inc. KMA28 Audio Selector Panel/Intercom System with internal Marker Beacon. Please read this manual carefully before beginning any installation to prevent damage and post-installation problems. Installation of this equipment requires special tools and knowledge.

2.1.2 Certification Requirements

When the digital audio warning system is installed in a certified aircraft, certification basis is the installer's responsibility. Due to the variety and options available for interface, Honeywell will only provide manufacturers' data for our equipment interface.

2.2 Unpacking and Preliminary Inspection

Use care when unpacking the equipment. Inspect the units and parts supplied for visible signs of shipping damage. Examine the unit for loose or broken buttons, bent knobs, etc. Verify the correct quantity of components supplied with the list in Section 1.6. If any claim is to be made, save the shipping material and contact the freight carrier. Do NOT return units damaged in shipping to Honeywell. If the unit or accessories shows any sign of external shipping damage, contact Honeywell to arrange for a replacement. Under no circumstances attempt to install a damaged unit in an aircraft. Equipment returned to Honeywell for any other reason should be shipped in the original packaging, or other UPS approved packaging.

2.3 Equipment Installation Procedures

2.3.1 Cooling Requirements

Forced air cooling of the KMA 28 is not required. However the unit should be kept away from heat producing sources (i.e. defrost or heater ducts, dropping resistors, heat producing avionics) without adequate cooling air provided.

2.3.2 Mounting Requirements

The KMA 28 must be rigidly mounted to the instrument panel of the aircraft structure and within view and reach of the pilot position(s). Installation must comply with FAA Advisory Circular AC 43.13-2A. The unit may be mounted in any area where adequate clearance for the unit and associated wiring bundle exist.

Avoid installing the audio panel close to high current devices or systems with high-voltage pulse type outputs, such as DME or transponders.

2.3.3 Mounting Rack Installation

Set the unit aside in a safe location until needed. Install the tray using six FHP 6-32 x ½" screws. The audio selector panel must be supported at front and rear of the mounting tray.

2.3.4 Connector Assembly

The unit connectors mate directly with the circuit boards in the KMA 28. The connectors are a Molex crimp-type, and require the use of a Molex hand crimp tool, EDP P/N 11-01-0203, CR6115B (or equiv.). The connectors are mounted to the unit tray with #4-40 screws, from the inside of the tray. Ensure that proper strain relief and chafing precautions are made during wiring and installation.

2.4 Cable Harness Wiring

Referring to the appropriate Appendix, assemble a wiring harness as required for the installation. All wires must be MIL-SPEC in accordance with current regulations. Two- and three-conductor shielded wire must be used where indicated, and be MIL-C-27500 or equivalent specification. Proper stripping, shielding and soldering technique must be used at all times. It is imperative that correct wire be used.

Refer to FAA Advisory Circular 43.13-2A for more information. Failure to use correct techniques may result in improper operation, electrical noise or unit failure. Damage caused by improper installation will void the warranty.

2.4.1 Noise

Due to the variety and the high power of radio equipment often found in today's general aviation aircraft, there is a potential for both radiated and conducted noise interference.

The KMA 28 power supply is specifically designed to reduce conducted electrical noise on the aircraft power bus by at least 50dB. Although this is a large amount of attenuation, it may not eliminate all noise, particularly if the amplitude of noise is very high. There must be at least 13.8 VDC present at the bottom connector, pin 20, of the KMA 28 for the power supply to work in its designed regulation. Otherwise, it cannot adequately attenuate power line noise. Shielding can reduce or prevent radiated noise (i.e., beacon, electric gyros, switching power supplies, etc.) However, installation combinations can occur where interference is possible. The KMA 28 was designed in a RFI hardened chassis and has internal Electromagnetic Interference (EMI) filters on all inputs and outputs.

Ground loop noise occurs when there are two or more ground paths for the same signal (i.e., airframe and ground return wire). Large cyclic loads such as strobes, inverters, etc., can inject noise signals onto the airframe that are detected by the audio system. Follow the wiring diagram very carefully to help ensure a minimum of ground loop potential. Use only Mil Spec shielded wires (MIL-C-275000, or better).

Radiated signals can be a factor when low level microphone signals are "bundled" with current carrying power wires. Keep these cables physically separated. It is very important

that you use insulated washers to isolate the ground return path from the airframe to **all** headphone and microphone jacks.

2.4.2 Existing KMA-24 Installation

If the installation replaces a KMA-24 (series -00, -01, -02 or -03), the existing 44 pin connector can be used for the bottom connector of the KMA 28 tray as is, providing it is properly installed and wired. No other changes are required except for external marker lights (see Appendix B for details). The "key" in the existing connector must be located between pins 7 and 8. This connector will be used in the bottom connector position. (See Appendix for complete wiring harness details.)

The existing ground bus may be reused for radio shield connections, if it was constructed so it can be relocated to the KMA 28 tray.

2.4.3 Existing PS Engineering PMA6000 installations

In 28-Volt aircraft, the dropping resistor may be removed, however, the 2 Amp breaker should be changed to 3 Amp. If either old unit is stereo (PMA6000S or PMA6000MS), no rewiring is necessary unless additional features are added.

2.4.3.1 Stereo KMA 28 installations into existing monaural PS Engineering PMA6000, PMA6000M.

Installations replacing PMA6000 or PMA6000M require re-wiring of the top connector to accommodate the stereo configuration. See appendixes for detailed interconnect information.

2.4.4 Power

The KMA 28 is compatible with both 14 and 28 Volt DC systems. A two (2) Amp circuit breaker is required for 14 VDC installations, and a three (3) Amp breaker for 28 VDC aircraft. Power and ground wires must be a twisted #18 AWG pair. Connect airframe power ground to J1 (bottom connector) Pin Z only. No dropping resistors are required.

2.4.5 Communications Push-to-Talk

An important part of the installation is the PTT (Push-To-Talk) switches that allow the use of your aircraft communications radio for transmissions. Only the person who presses their PTT switch will be heard over the radio. If the pilot and copilot both use the PTT, only the pilot position has access to the radio. The pilot position will have PTT control regardless of the mic selector switch or copilot PTT when the KMA 28 is in the EMERGENCY mode.

2.4.6 Transmit Interlock

Some communications transceivers use a transmit-interlock system. To fully utilize the Split Mode feature, this function must be disabled. Consult that manufacturer's installation manual.

2.4.7 "Swap" Mode

When a momentary, normally open, push-button switch is connected between pin 10 on the top connector and aircraft ground, the user can switch between Com 1 and 2 by depressing this switch without having to turn the mic selector switch. This yoke-mounted switch eliminates the need to remove your hands from the yoke to change transceivers.

2.4.8 Backlighting

The KMA 28 has an automatic dimming of the pushbutton annunciator LEDs and marker lamps controlled by a photocell. Control of the unit backlighting is through the aircraft avionics dimmer. Connect the dimmer control line to J1 pin D for 14 volt systems, and to J1 pin F for 28 volt systems. Pin E is light ground.

If an external dimmer control is not used, a constant low level back light illumination can be established for nighttime viewing. Pin D or F (depending on system voltage) must be tied to power (J1, pin 20) for the back lighting system to work. The photocell mounted in the unit face will automatically adjust the intensity of the push-button annunciator LEDs.

2.4.9 Unswitched inputs

J1, pin T is the unswitched input number 1 and J1 pin 17 is unswitched input 2. These inputs are presented to the pilot and copilot regardless of the audio configuration, and will always mute the entertainment inputs. These 510Ω inputs can be used for altimeter DH audio, GPS waypoint audio, autopilot disconnect tones, air-to-ground (Flitefone) telephone ringer or any other critical audio signal. This input is not related to the cellular telephone interface.

2.4.10 Intercom wiring

The top connector (J2) is for the intercom and additional functions. See Appendix for intercom connection configurations. It is critical to the proper operation of this system to have this connector wiring made in accordance with these diagrams. Use 2- and 3-conductor, MIL-spec cable as shown. Connect the shields at the audio panel end only, and tie to the audio low inputs as shown.

2.4.10.1 Entertainment Input

NOTE: Use the low level output of any entertainment device to connect to the audio panel. Maximum signal level is **1 VAC** p-p.

DO NOT use a speaker-level output, this will cause internal damage in the audio panel

2.4.10.1.1 Stereo entertainment

Two stereo entertainment devices (CD player, cassette player, etc.) can be connected to the unit. Install two ¹/₈-inch stereo jacks in a convenient location so that the pilot can plug

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in the entertainment devices into the system. The audio signal at the entertainment input must be a minimum of 500 mV P-P per channel for optimum music performance.

All entertainment devices must be switched **off** for both takeoff and landing.

2.4.10.1.2 Entertainment distribution

Entertainment source #1 provides music for the pilot and copilot positions, while entertainment source #2 provides music for the four passenger positions. The KMA 28-system incorporates a "Soft Mute" system. This will mute the entertainment devices during ICS or radio conversation.

Any signal appearing in the unswitched audio inputs will always mute the entertainment sources, even though the passengers may not hear the audio tone itself.

Entertainment inputs #1 and #2 can be paralleled so a single entertainment source can serve both the passengers and the crew. It is suggested however, that a switch (DPDT) is installed between the single entertainment device and entertainment input #1. This will allow the pilot and copilot to decide if they hear entertainment while in the Crew mode.

Caution: Local oscillators and internal signals from some entertainment equipment can cause undesired interference with other aircraft systems. Before takeoff, operate the entertainment devices to determine if there is any adverse effect within the aircraft systems. If any unusual operation is noted in flight, immediately switch off the entertainment devices.

All entertainment devices must be switched off for both takeoff and landing.

2.4.10.1.3 Entertainment 2 Mute (Pin V)

The ICS button on the KMA 28 controls the muting ("Karoake mode") of entertainment source #1.

Connecting J2 pin V to ground through a SPST switch places the entertainment #2 music source into the Karoake Mode. In this mode, incoming music and intercom conversation will not mute the music for the passengers' intercom net. This allows uninterrupted music during casual conversation and at times when radio communications are of lessor importance.

2.4.11 Com 3 Audio

As installed in the standard configuration, the KMA 28 Com 3 audio is heard while the mic selector switch is in the Com 3 position (fully CCW). Pushing the receiver selector buttons can monitor Com 1 and Com 2 audio. If monitoring of Com 3 is desired in Com 1 or Com 2 mic selector position, connect Com 3 audio in parallel to the AUX input (J1, pin 11).

2.4.12 Public Address function

The KMA28 has a Public Address function. By connecting the top connector (J2), Pin 18 to ground, the pilot's microphone audio is placed on the cabin speaker output. When the

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pilot's PTT is activated, his voice is heard over the speaker. The copilot can continue to use the selected com.

We recommend installing a toggle switch to connect the cabin speaker output (pin W, bottom connector) to a rear or public address speaker instead of the cockpit speaker close to the pilot. This will prevent feedback.

2.4.13 PA Mute (J1, Pin 18)

Pin 18 of J1 is a TTL logic output that is pulled low during PTT operation. This serves as an input to external public address system to prevent feedback during transmissions.

2.4.14 Control Output (J2, Pin A)

Pin A of the top connector is pulled to ground whenever the AUX button is depressed. This serves as a control line for external devices, such as an entertainment system that the pilot wishes to control.

2.4.15 VOX Override (J2, Pin U)

Connecting pin U of the KMA 28 of J2 to ground will force the *IntelliVox*® open. This can be hooked up as a hot mic switch which will place all microphones on the intercom. This can also be connected through a momentary switch to serve as a VOX test switch, if desired. Because the *IntelliVox*® will close in the presence of a steady tone, this pin is used in testing to defeat the *IntelliVox*® software.

2.5 Marker Installation

The marker beacon receiver is included in the KMA 28.

2.5.1 Middle Marker Sense

A Middle Marker sense output signal is available from the KMA28 to flight control systems. This function will not operate during the test mode. This output will go to +4.7 VDC (± 0.5 VDC) when a valid Middle Marker signal is received. This output is J1, pin 2.

2.5.2 External Marker Lights

For installations that require external marker beacon lights, there are three outputs that can drive 12-Volt lamps only. The external output lamps are driven high (+9 VDC ± 1.5 VDC) when active. Maximum source current per lamp is 125 mA. Voltage varies with photocell dimming.

2.5.3 Marker Antenna Installation

Refer to aircraft and antenna manufacturer's installation instructions, as well as AC43.13-2A (or later revision), Chapter 3, for information on proper antenna installation techniques. The marker beacon antenna must be mounted on the bottom of the aircraft.

2.6 Adjustments

The KMA 28 is factory adjusted to accommodate the typical requirements for most aircraft configurations. There are five adjustments however, that will allow the installer to tailor the specific functions.

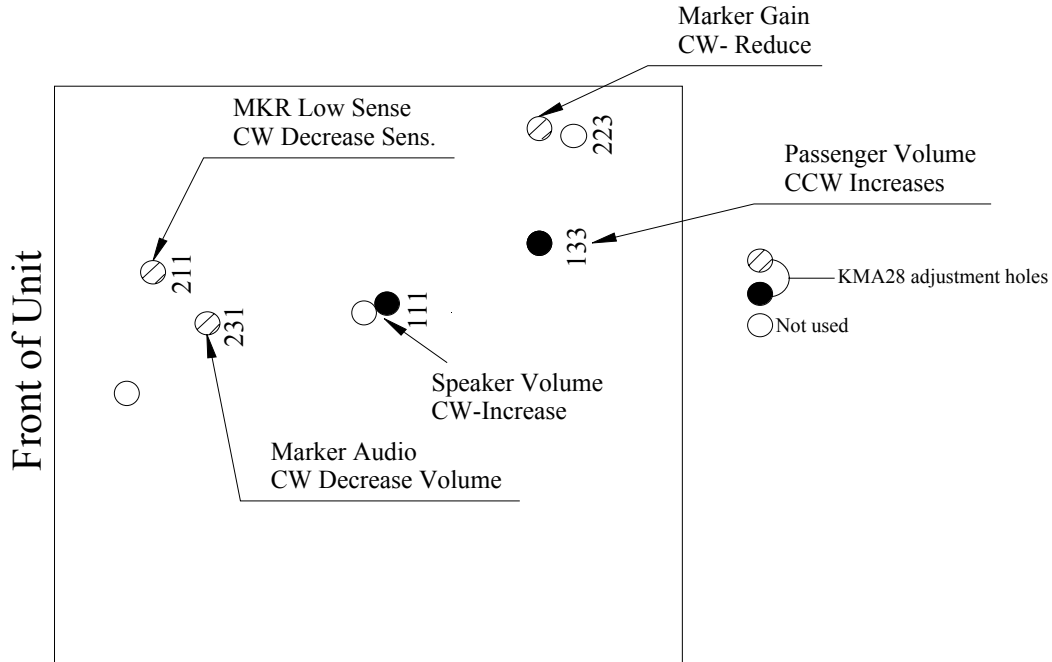


Figure 2-1- KMA 28 Adjustments

2.7 Communications Antenna Installation Notes

For best results while in Split Mode, it is suggested that the one VHF communications antenna is located on top of the aircraft while the other communications antenna is installed on the bottom. Any antenna relocation must be accomplished in accordance with AC 43.13-2A, aircraft manufacturers' recommendations and FAA-approved technical data.

Warning:

It is probable that radio interference will occur in the split mode when the frequencies of the two aircraft radios are adjacent, and/or the antennas are physically close together. Honeywell makes no expressed or implied warranties regarding the suitability of the KMA 28 in Split Mode.

2.8 Wireless telecommunications interface

The KMA 28 has interface capability with units such as the AirCell units. It is the user's responsibility to determine the appropriate legal use of the equipment, and provide the services.

Interface to the AirCell unit is through J1 (bottom) connector, pins 14 and N. Pin 14, labeled cellphone ring, is connected to pin V of the 3100D J3 connector and pin N of J1 is

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connected to pin W of the J3 connector. On the AirCell interface diagram these are listed as data/fax lines, but they are used for voice interface in this case.

Use a 2-conductor with shield cable, and connect the shield to Pin M of the J3.

If interface is desired with another type of wireless telecommunications unit, the aircraft owner can purchase an after-market interface cable. By Federal Communications Commission (FCC) regulations, these can only be used on the ground in the United States.

Unauthorized use of cellular telephone devices in aircraft is subject to FCC enforcement action, which may include a \$10,000 fine per incident. Honeywell, Inc. does not endorse using unapproved cellular telephone equipment in flight, and takes no responsibility for the user's action.

2.8.1 Hook Switches

While the mic selector acts as the hook switch for the pilot, additional hook switches must be installed to have full access to the cellphone system. The copilot hook switch is a SPST switch that connects pin L of J2 on the KMA 28 to ground to place the copilot on the cellphone.

KMA 28 J2, pin M is the passenger hook switch. Install a SPST switch in a location adjacent to each passenger headset where cellphone use is desired. When pin M is connected to ground through any switch, the passenger microphones are all on the cellphone system.

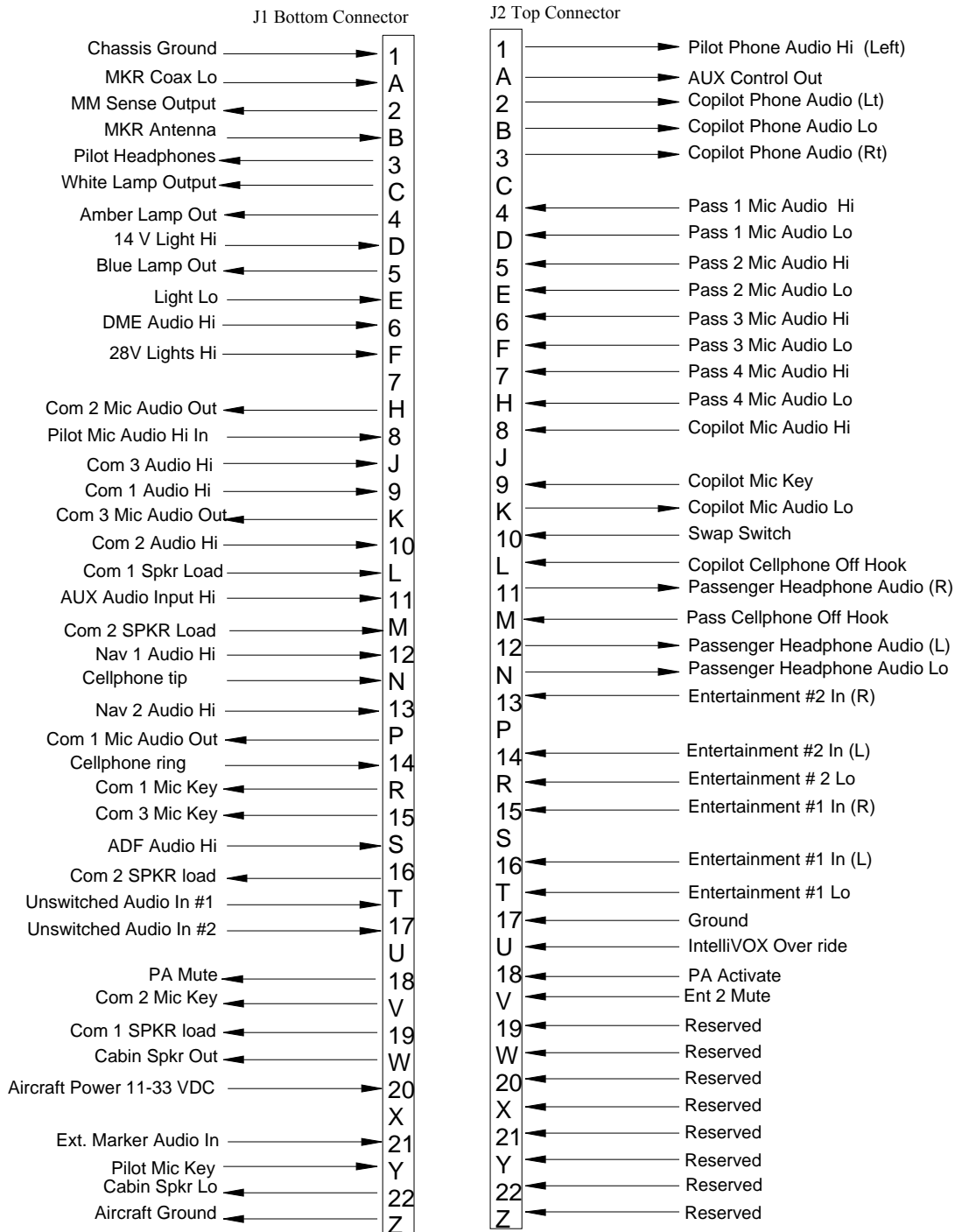
The wireless communication “tel” system utilizes an intercom loop. Therefore, any time the cellphone is in use from the pilot or copilot side, pilot and copilot will lose intercom capability. In the ALL mode, when the passengers’ activate the cell phone, the pilots will have intercom, and continue to hear and transmit over the avionics normally. However the passengers will not have intercom, because they are on the telephone.

To prevent unwanted distractions, only the pilot and copilot will hear an incoming call ring signal. They can then decide to allow a passenger to activate the hook switch and use the telephone.

If the pilot has selected “TEL” mode, the passengers cannot access the telephone in the “CREW” intercom mode, but they will hear the call.

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2.9 KMA 28 Pin Assignments



2.10 Post Installation Checkout

After wiring is complete, verify power is ONLY on pin 20 of the J1 (bottom connector), and airframe ground on bottom connector pin Z. Failure to do so will cause serious internal damage and void the warranty.

2.11 Unit Installation

To install the KMA 28, gently slide the unit into the mounting rack until the hold-down screw is engaged. While applying gentle pressure to the face of the unit, tighten the 3/32" hex-head in the center of the unit until it is secure. DO NOT OVER TIGHTEN.

Warning: Do not over-tighten the lock down screw while installing the unit in tray. **Internal damage will result.**

2.11.1 Operational Checkout

1. Apply power to the aircraft and avionics. Switch on the unit by pressing the volume knob.
2. Plug headsets into the pilot, copilot, and occupied passenger positions.
3. Rotate the Mic Selector Switch to the **Com 1** position.
4. Verify that the **Com 1** button lights. Verify that the green transmit LED (Light Emitting Diode) near the mic selector is not illuminated. If the LED is on, stop testing and troubleshoot the microphone PTT installation.
5. Verify proper transmit and receive operation from the copilot position, noting that the copilot PTT switch allows proper transmission on the selected transceiver.
6. Verify that pushing the **COM 2** button causes the button to illuminate, and the Com 2 receiver to be heard. Verify operation on Com 1 from the pilot position.
7. Repeat for Com 2 and Com 3, (if installed).
8. Rotate the mic selector switch to the **COM 1/2** position. Verify that the pilot communicates on Com 1 and the copilot on Com 2.
9. Rotate the mic selector switch to the **COM 2/1** position. Verify that the pilot communicates on Com 2 and the copilot on Com 1.
10. Rotate the mic selector switch to the **TEL** position. Verify that the pilot headset is connected to the cellular telephone system (if installed). Verify that by using the pilot side PTT, the pilot can transmit on Com 1. The copilot has no transmit capability in TEL mode.
11. Verify proper operation of all receiver sources by selecting them using the button. Note that the button for the receiver sources stays in, and the button illuminates to show which source is in use.
12. Push in the SPR button. Verify that all selected audio is heard in the cockpit speaker. Verify that the audio mutes when the mic is keyed.
13. Verify that the LED in the lower right side illuminates when either push to talk is keyed.
14. Verify proper Intercom system operation in the **ALL**, **ISO** and **CREW** modes (see Table 3-1).

15. Verify that the audio selector panel system does not adversely affect any other aircraft system by systematically switching the unit on and off, while monitoring the other avionics and electrical equipment on the aircraft.

2.11.1.1 Marker Checkout

1. Connect a ramp generator at the antenna end of the marker coax. With the unit under test in HI sensitivity, verify that a 160 μV , modulated 95% with 1300 Hz, signal will illuminate the amber (M) marker light, and that marker audio is present in the headphones when the Marker Audio (MKR) push-button has been depressed. Select SPR for speaker to verify marker audio availability on the cabin speaker. Verify that the white (A) and blue (O) lights will illuminate within $\pm 3\text{dB}$ of the amber lamp, with 3000 HZ and 400 Hz applied, respectively.
2. Repeat with the unit in LOW sensitivity, with 430 μVolts applied.
3. Connect the marker antenna and verify proper operation.

2.11.2 Receiver Sensitivity

Although the KMA28 meets FAA TSO-C35d sensitivity specifications, the sensitivity of the receiver has been adjusted to meet real world requirements (150 μV and 430 μV , soft). This will usually eliminate the need for the avionics shop to reduce the sensitivity in the field so as to prevent early detection of the marker beacons. If your particular installation requires more or less sensitivity, see adjustment section 2.6, and figure 2-1.

2.12 Cellular Interface Checkout

When a wireless telecommunication system is installed and configured, a dial tone will appear in the headset of the pilot when the mic selector is in the "Tel" position. In "ALL" intercom mode, a dial tone will be heard whenever the copilot or passenger's hook switch is closed.

2.13 Final Inspection

Verify that the wiring is bundled away from all controls and no part of the installation interferes with aircraft control operation. Move all controls through their full range while examining the installation to see that no mechanical interference exists. Verify that the cables are secured to the aircraft structure in accordance with good practices, with adequate strain relief. Ensure that there are no kinks or sharp bends in the cables and coaxial cables. Verify that the cables are not exposed to any sharp edges or rough surfaces, and that all contact points are protected from abrasion.

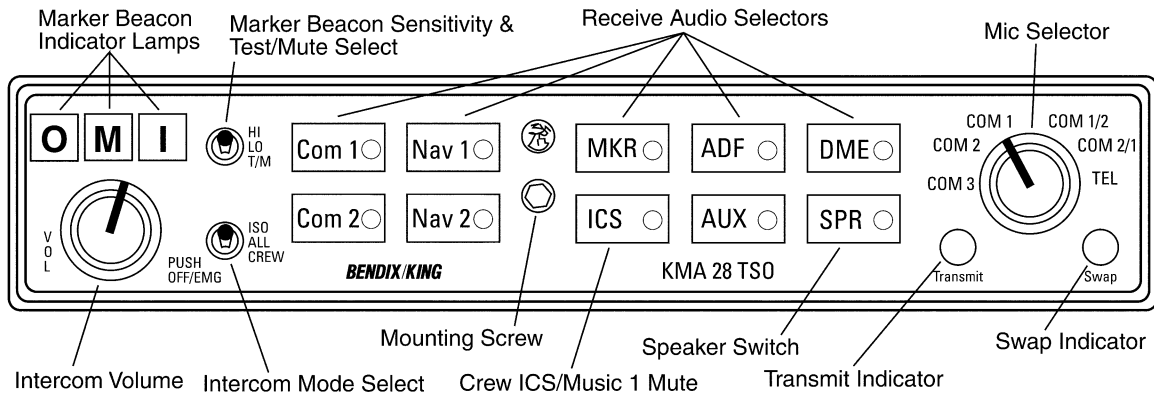
Complete log book entry, FAA Form 337, weight and balance computation and other documentation as required. Sample text for FAA Form 337, and instructions for continuing airworthiness can be found in Appendix D.

Return completed warranty registration application.

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Section III KMA28 OPERATION

GENERAL INFORMATION



KMA28 controls

3.1 Audio Selector

Receiver audio is selected through two momentary and six latched, push-button, backlit switches. **Com 1** and **Com 2** are the momentary switches.

Because the rotary microphone selector switch controls what transceiver is being heard, the **Com 1** and **Com 2** push-buttons are of the momentary type and do not remain in when selected. This is also part of the "auto" function. You will always hear the audio from the transceiver that is selected for transmit by the rotary mic selector switch.

The users can identify which receivers are selected by noting which of the green switch LEDs are illuminated. Push buttons labeled **Nav 1**, **Nav 2**, **DME**, **MKR** (Marker), **ADF**, **AUX** (auxiliary), and **SPR** (Speaker) are "latched" type switches. When one of these buttons is pressed, it will stay in the "in" position. Press the switch again and it will be in the "out" position and remove that receiver from the audio.

3.1.1.1 Key "click"

The KMA28 is equipped with an electronic "click" to provide additional feedback for button operation. To activate the key click, push and hold BOTH COM 1 and COM 2 receiver buttons for five seconds, and release. Repeat to defeat the click.

3.1.2 Speaker Amplifier

The "**SPR**" in the push-button section stands for speaker. This switch will place all selected audio on the cockpit speaker when this switch is selected.

3.1.3 Public Address (PA) Function

The KMA 28 has a public address capability when an optional external PA switch is installed. When this switch is put into the PA position, the pilot's microphone is placed on a speaker output. The copilot can continue to use the selected Com radio.

When this PA function is installed a separate cabin speaker (rather than the cockpit speaker) is usually utilized to prevent feedback.

3.2 Power Switch /Emergency (EMG) Operation

Unit power is turned on and off by pushing the volume knob. In the OFF or "EMERGENCY" position, the pilot is connected directly to Com 1. This allows communication capability regardless of unit condition. Any time power is removed or turned OFF, the audio selector will be placed in the emergency mode.

The power switch also controls the audio selector panel functions, intercom, and marker beacon receiver. Unless the mic selector is in Com 3 mode, at least one of the selected audio LEDs will be on (Com 1 or Com 2).

3.3 Microphone Selector

When the mic selector switch is in the **Com 1** position, both pilot and copilot will be connected to the Com 1 transceiver. Only the person who presses their Push To Talk (PTT), will be heard over the aircraft radio. Turning the rotary switch to the COM 2 position will place pilot and copilot on Com 2.

The KMA28 gives priority to the pilot's PTT. If the copilot is transmitting, and the pilot presses his PTT, the pilot's microphone will be heard over the selected com transmitter.

Turning the mic selector fully counterclockwise places the pilot and copilot on Com 3. Com 3 receive audio is automatically placed in the headset (and speaker if selected). Com 1 and/or Com 2 receiver audio can be selected to monitor those transceivers.

The KMA28 has an automatic selector mode. Audio from the selected transceiver is automatically heard in the headsets and speaker. You can check this function by switching from COM 1 to COM 2 and watch the selected audio light on the selector change from COM 1 to COM 2. This ensures the pilot will *always* hear the audio from the transceiver he is transmitting on.

When transmitting, the COM 1 or COM 2 LED in the KMA28 audio selector will blink as a further indication of the selected transmitter.

When switching the mic selector rotary switch from COM 1 to COM 2, while COM 2 audio had been selected, Com 1 audio will continue to be heard. This eliminates the pilot having to switch Com 1 audio back on, if desired.

When switching from COM 1 to COM 2 while Com 2 has NOT been selected, Com 1 audio will be switched off. In essence, switching the mic selector will not effect the selection of Com audio.

3.3.1 Swap Mode (Switch from Com 1 to Com 2 remotely)

With an optional yoke mounted, momentary switch, the pilot can change from the current Com transceiver to the other by depressing this switch. When “Swap Mode” is active, an annunciator in the lower right corner of the unit will illuminate, indicating that the mic selector switch position is no longer current. To cancel “Swap Mode,” the pilot may either press the yoke mounted switch again, or turn the mic selector switch to the Com that is active.

3.3.2 Split Mode

Turning the rotary switch to COM 1/COM 2 places the KMA28 into "Split Mode." This places the pilot on Com 1 and the copilot on Com 2. An example of this useful feature is when the pilot may want to talk to Air Traffic Control, while the copilot may be speaking to Flight Watch. Although this mode has limitations (see below) we believe you will find this to be a useful feature.

Switching to Com 2/Com 1 will reverse the “Split Mode” radio selection. The pilot will be on Com 2 and the copilot will be on Com 1.

Note:

Due to the nature of VHF communications signals, and the size constraints in general aviation aircraft, it is probable that there will be some bleed-over in the Split mode, particularly on adjacent frequencies. In addition, if the Com radios in the installation utilize a “transmit interlock” system, the split mode may not work properly unless the interlock feature is disabled.

Honeywell makes no expressed or implied guarantee regarding the suitability of Split Mode in a given installation.

Note: Split Mode does not turn off other (Nav, ADF, etc.) selected audio to pilot. However, the copilot will only hear the selected communications receiver and unswitched audio.

3.3.2.1 Split Mode ICS

In split mode, the pilot and copilot are isolated from each other on the intercom, simultaneously using their respective radios. Depressing the **ICS** button in Split Mode will activate VOX intercom between the pilot and copilot positions. This permits intercommunication when desired between the crew. Pressing the ICS button again disables this crew intercom function.

3.3.3 Telephone Mode

The “TEL” position, fully CW on the mic selector switch, is the pilot’s “hook” switch. This is active only when the system is interfaced to an appropriate approved system, such as the AirCell™ system. Placing the mic selector in TEL places the pilot microphone and

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headphones on the cellphone. The pilot PTT will switch the pilot mic to the COM 1, and allow continued aircraft communications as well.

NOTE: Placing the mic selector switch in the TEL position will disable pilot and copilot intercom, as the intercom circuit is transferred to the telephone use. In crew or ISO mode, placing the switch in TEL mode removes the passengers access to the telephone.

If interface is desired with another type of wireless telecommunications unit, the aircraft owner can purchase an after-market interface cable. By Federal Communications Commission (FCC) regulations, these can only be used on the ground in the United States.

Interface cables are available for specific telephones. The following is a partial list of possible interface cables. These must be purchased separately, and are not for sale from Honeywell.

Compatible Phones
Audiovox Series 5
Motorola TeleTAC, DPC 550, DPC65-, Lite Series, Profile Series
Motorola Elite, M70, M75, SC-725
Motorola Bag Phones, Mobiles
NEC100 Series, 110, 120, 180, Sport
NEC 700 & 800 Series
OKI 900/910, AT&T 3730/3710
OKI 1150/1145, AT&T 3760
Fujitsu PCX
Mitsubishi 4000, DiamondTel 22X/20X/18X
NEC960
NEC DT2000 Digital Phone

NOTE:

Unauthorized use of cellular telephone devices in aircraft is subject to FCC enforcement action, which may include a \$10,000 fine per incident. Honeywell, Inc. does not endorse using unapproved cellular telephone equipment in flight, and takes no responsibility for the user's action.

3.4 Intercom System

3.4.1 IntelliVox® VOX-Squelch

No adjustment of the *IntelliVox*® squelch control is necessary. Through three individual signal processors, the ambient noise appearing in all six microphones is constantly being sampled. Non voice signals are blocked. When someone speaks, only their microphone circuit opens, allowing him or her to communicate on the intercom.

The system is designed to block continuous tones; therefore people humming or whistling in monotone may be blocked after a few moments.

For best performance, the headset microphone must be placed within ¼ inch of your lips, preferably against them. It is also a good idea to keep the microphone out of a direct wind

path. Moving your head through a vent air stream may cause the *IntelliVox*® to open momentarily. This is normal.

For optimum microphone performance, Honeywell recommends installation of a Microphone Muff Kit from Oregon Aero (1-800-888-6910). This will not only optimize VOX acoustic performance, but will improve the overall clarity of all your communications.

3.4.2 Volume Control

The volume control knob adjusts the loudness of the intercom for the pilot and copilot only. It has no effect on selected radio levels, music input levels or passengers' volume level.

Adjust the radios and intercom volume for a comfortable listening level for the pilot. Most general aviation headsets today have built-in volume controls; therefore, passenger volume can be adjusted at the headset.

3.4.2.1 Mono headsets in Stereo Installation

All passenger headsets are connected in parallel. Therefore, if a monaural headset is plugged in to a Stereo KMA28 installation, one channel will be shorted. Although no damage to the unit will occur, all passengers will lose one channel.

3.4.2.2 Intercom Modes

The lower switch on the left side is a 3-position mode switch that allows the pilot to tailor the intercom function to best meet the current cockpit situation.

ISO: (Up Position): The pilot is isolated from the intercom and is connected only to the aircraft radio system. He will hear the aircraft radio reception (and sidetone during radio transmissions). Copilot will hear passengers' intercom and Entertainment 1, while passengers will hear copilot intercom and Entertainment 2. Neither will hear aircraft radio receptions or pilot transmissions.

ALL: (Middle Position): All parties will hear the aircraft radio and intercom. Crew will hear Entertainment 1, passengers will hear Entertainment 2. During any radio or intercom communications, the music volume automatically decreases. The music volume increases gradually back to the original level after communications have been completed.

CREW (Down Position): Pilot and copilot are connected on one intercom channel and have exclusive access to the aircraft radios. They may also listen to Entertainment 1. Passengers can continue to communicate with themselves without interrupting the Crew and also may listen to Entertainment 2.

Anytime the KMA28 is in either the COM 1/COM 2, COM 2/COM 1, ("Split Mode"), the pilot and copilot intercom is controlled with the ICS button. The passengers will maintain intercommunications, but never hear aircraft radios.

3.4.2.3 Entertainment Input

The audio selector panel has provisions for two separate entertainment input devices. They operate independently in the KMA28. The volume control does not affect music level.

While in the ISO (Isolate) mode, the copilot will hear Entertainment 1 while the four passengers will hear Entertainment #2. The pilot will hear Entertainment 1 at a level muted about 95%. In normal operation, whenever a person speaks, or if the aircraft radio becomes active, the music will automatically mute and then will gradually return to the original listening level when the intercom or radio conversation ceases.

When in the ALL mode, pilot and copilot will hear Entertainment 1 input while all passengers will hear the Entertainment 2 source. While in the CREW mode, pilot and copilot will hear entertainment input #1 while the passengers may listen to entertainment input #2.

3.4.2.4 Soft Mute and Soft Mute inhibit

The Soft Mute feature assures that the aircraft radio transmissions will not be missed due to entertainment playing. When there is radio reception or intercom conversation, the music level is dropped to a background level. When the radio or intercom traffic ceases, the level gradually returns to normal.

The front panel ICS switch controls muting of entertainment source #1. Pushing this button places the ICS in Karaoke (or sing along) mode, which inhibits the soft mute feature. This allows the music to continue uninterrupted by intercom or radio traffic when cockpit workload is appropriate. Pushing the button again will release the mute inhibit function.

The passenger music, source #2, can be placed in the Karaoke mode if a remote switch is installed in the aircraft.

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Table 3-1 Intercom Modes

Mode	Pilot Hears	Copilot Hears	Passenger Hears	Telephone	Comments
Isolate	A/C Radios Pilot Sidetone (during radio transmission) Entertainment 1 is Muted	Copilot and passenger intercom Entertainment #1	Passenger and Copilot intercom Entertainment #2	"Phone Booth" mode Pilot has exclusive use of the telephone. In TEL, Pilot connected to Com 1 for PTT TX and receive.	This mode allows the pilot to communicate without the others bothered by the conversations. Copilot and passengers can continue to communicate and listen to music
All	Pilot Copilot A/C Radio Passengers Entertainment #1	Copilot Pilot A/C Radio Passengers Entertainment #1	Passengers Pilot Copilot A/C Radio Entertainment #2	All have access to phone through Hook Switch. Pilot access through TEL switch. All hear telephone audio.	This mode allows all on board to hear radio reception as well as communicate on the intercom. Music and intercom is muted during intercom and radio communications
Crew	Pilot Copilot A/C Radio Entertainment #1	Copilot Pilot A/C Radio Entertainment #1	Passengers Entertainment #2	Pilot and copilot don't have phone access, unless mic sel in TEL. Passengers have phone through Hook Switch, Passengers hear phone audio.	This mode allows the pilot and copilot to concentrate on flying, while the passengers can communicate amongst themselves.

3.5 Marker Beacon Operation

The Marker Beacon Receiver uses visual and audio indicators to alert you when the aircraft passes over a 75 MHz transmitter.

The audio from the Marker Beacon Receiver can be heard by selecting the "MKR" push-button switch.

A three-position switch is used to set the receiver sensitivity and to test the indicator lamps. Use "HIGH" sensitivity initially. This allows you to hear the outer marker beacon about a mile out. Then select the "LOW" sensitivity to give you a more accurate location of the Marker. When used only for approach markers, many pilots choose to leave the switch in the low sensitivity position.

The momentary down switch position is labeled "T/M" (Test/Mute) and illuminates all three lamps simultaneously to assure they are in working order.

The "T/M" position is also a Marker Beacon "Mute" function. Pushing this switch while receiving a marker beacon signal will cause the audio to be temporarily silenced. No action is required to restore the audio in time for the next beacon.

3.6 Telephone Operation (if equipped with approved system)

Each intercom position has a "hook switch." The pilot's hook switch is the "TEL" mode on the mic selector, the others are individual switches mounted adjacent to the headset jacks.

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When the intercom is in **ALL** mode, the pilot can speak on the phone only if the mic selector switch is in **TEL** position. All intercom positions will hear the telephone conversation. Anyone who places his or her switch into the "off-hook" position will also be heard on the phone. All will hear selected audio. Com 1 audio is automatically heard in the headsets. The pilot will have transmit capability on Com 1, simply by using the PTT switch.

In **CREW** mode, the pilot and copilot may use the telephone, with their respective hook switch (the pilot selects TEL on the mic selector). Any passenger who places their switch into the off-hook position will also have access to the phone, and all four passengers will hear the conversation.

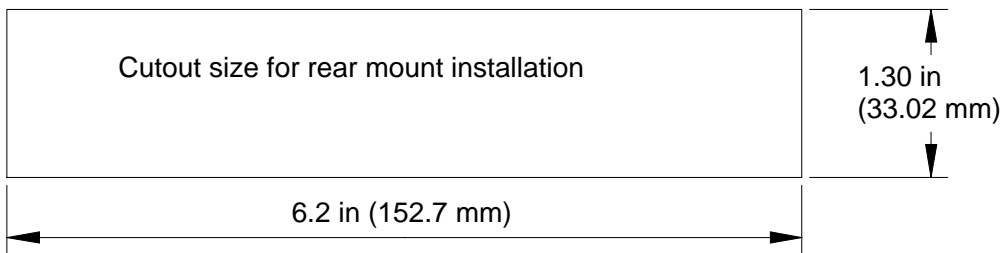
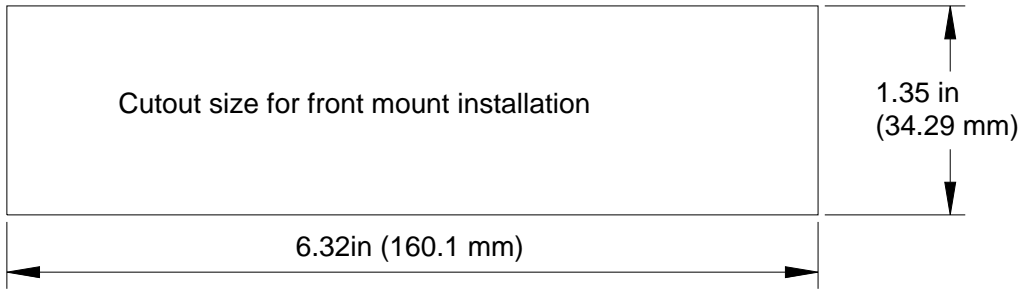
In **ISO** intercom mode, when the KMA28 is in the **TEL** mode, the pilot position is in the "Phone Booth." Only the pilot will hear the telephone, and only he will be heard. He will also have access to Com 1, and will transmit on that radio using the PTT. All selected audio is provided.

In all cases, only the pilot (and copilot in ALL or CREW) will hear the cellphone ring. At that time they can chose to allow a passenger to take the call, or answer the phone.

Note: Because the phone uses an intercom circuit, all stations on that circuit will lose intercom capability when it is in use.

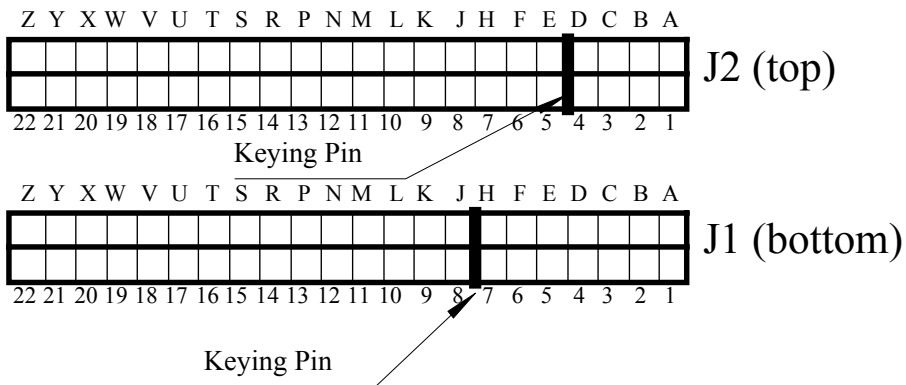
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Appendix A – Installation Drawings



Weight: 1.5 lb with tray and connectors (.68 kg)

Connector viewed from the rear



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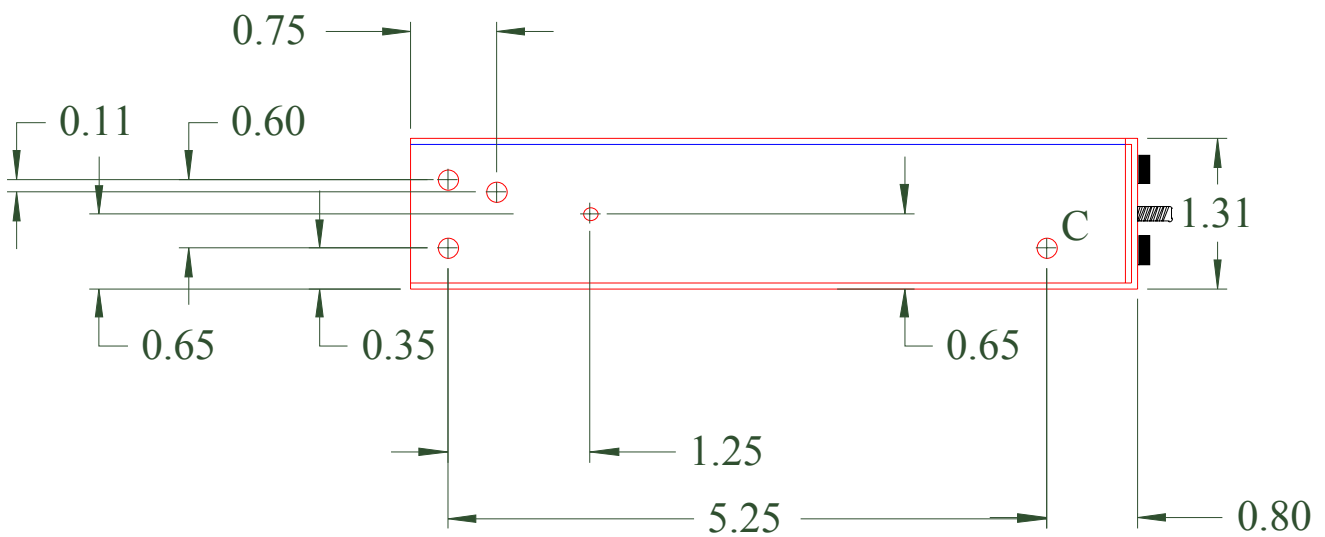
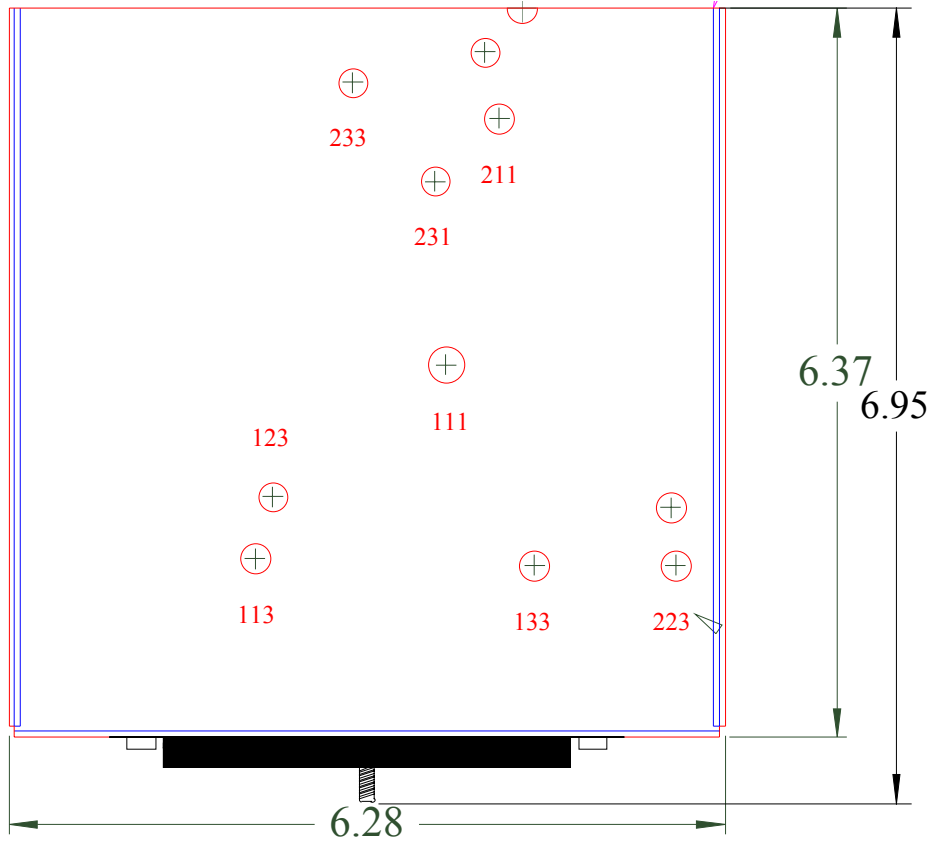


Figure 4-1 Tray Dimensions in inches

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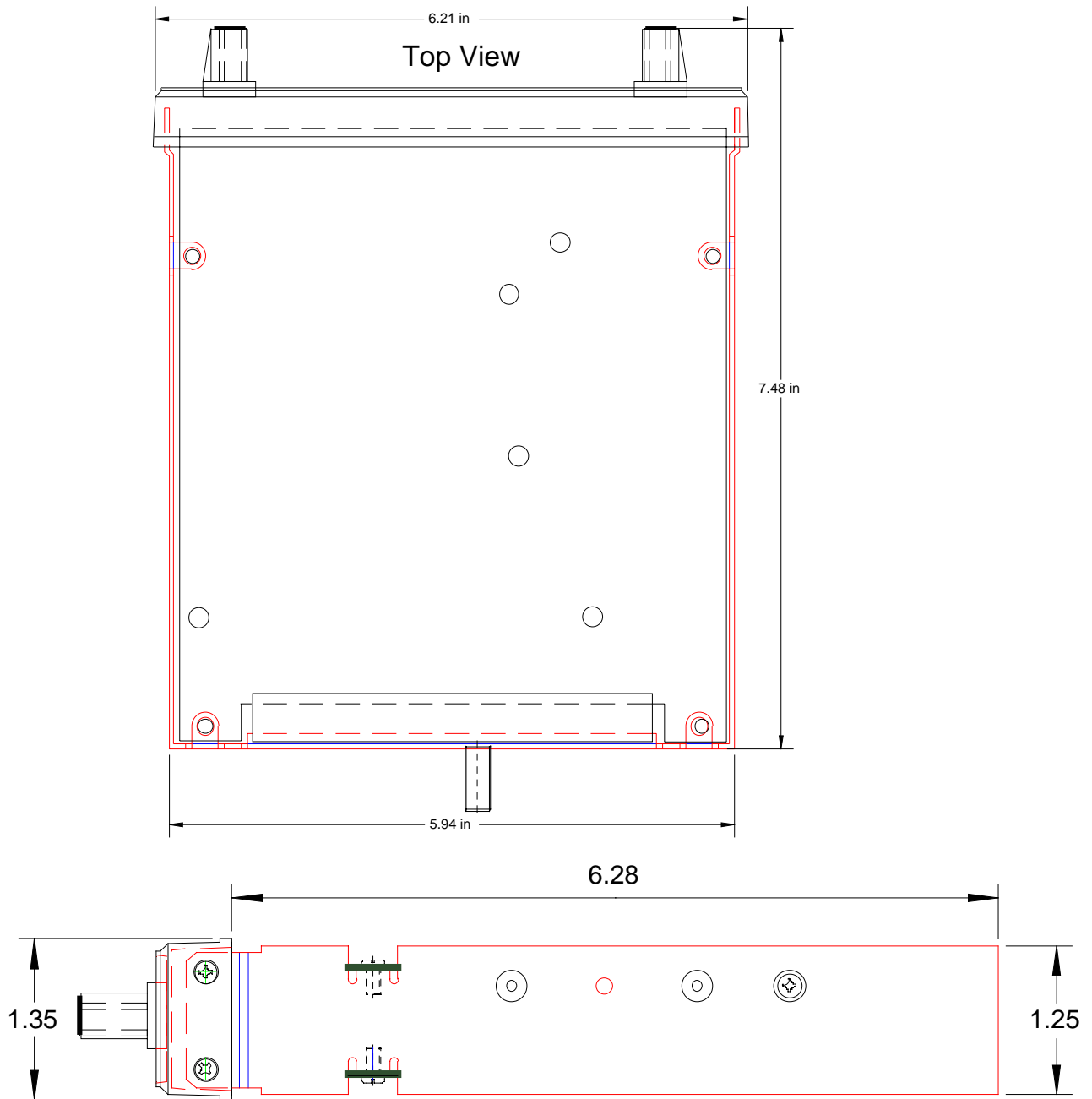


Figure 4-2 Unit External Dimensions in inches

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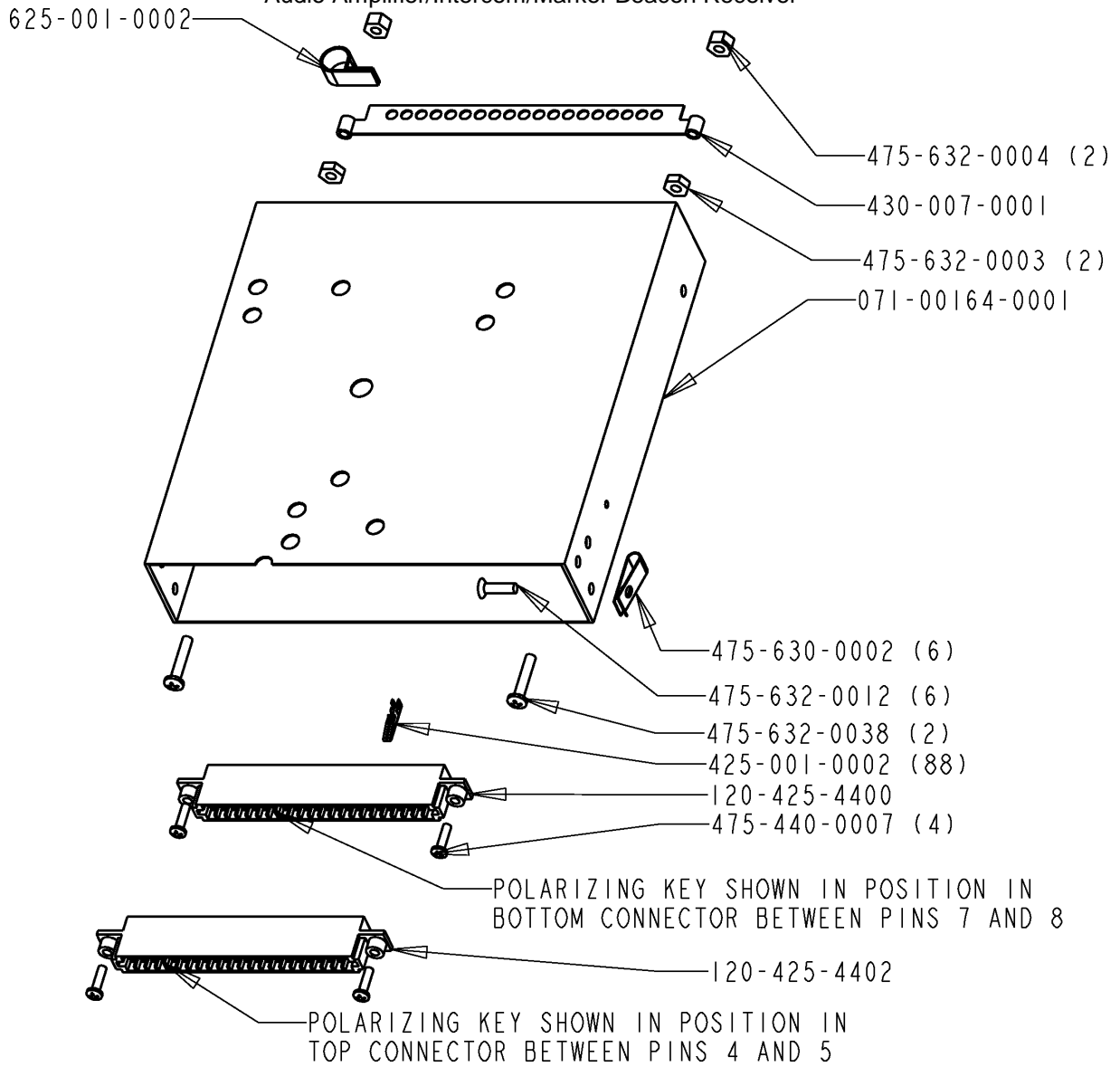
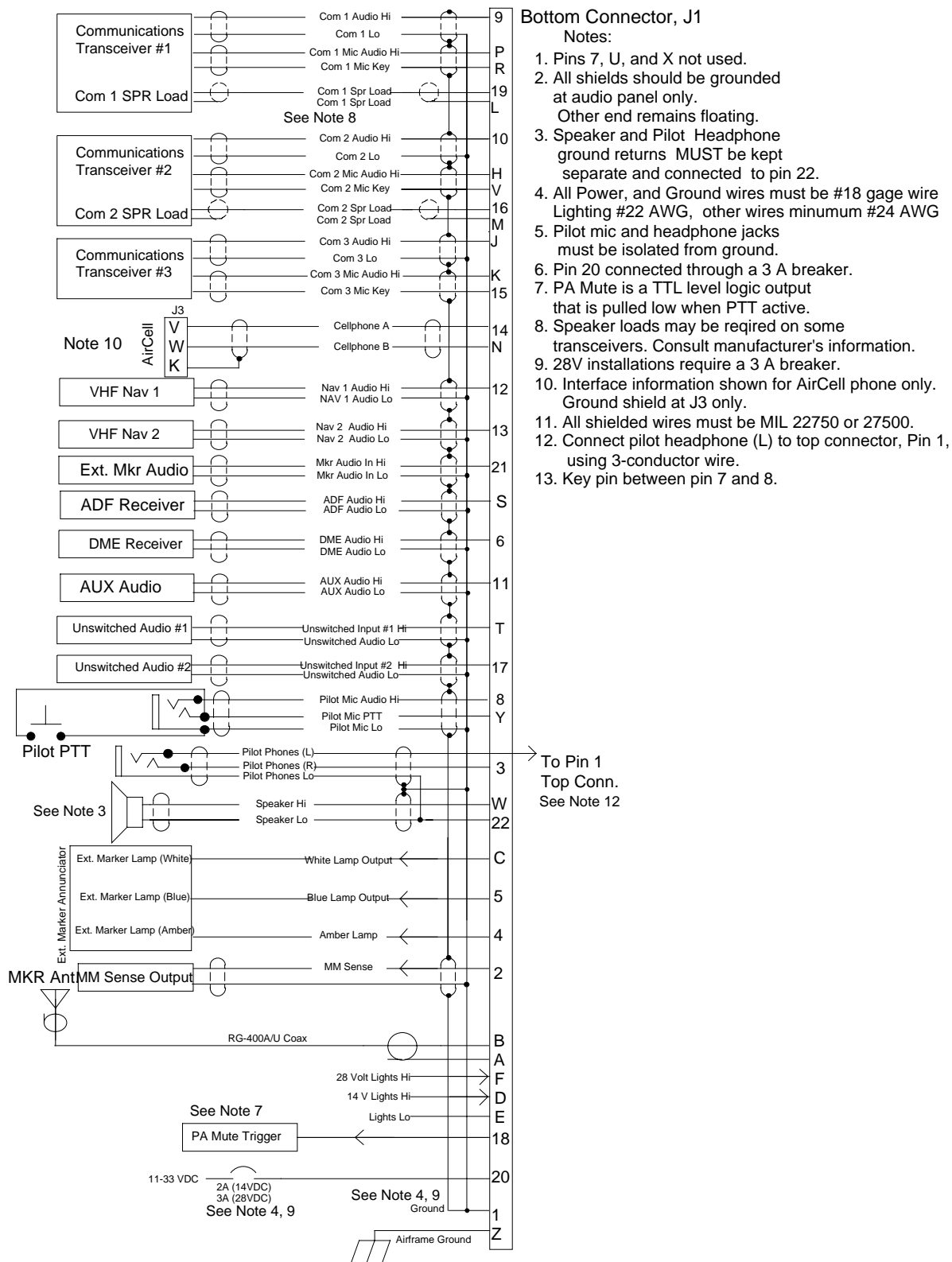


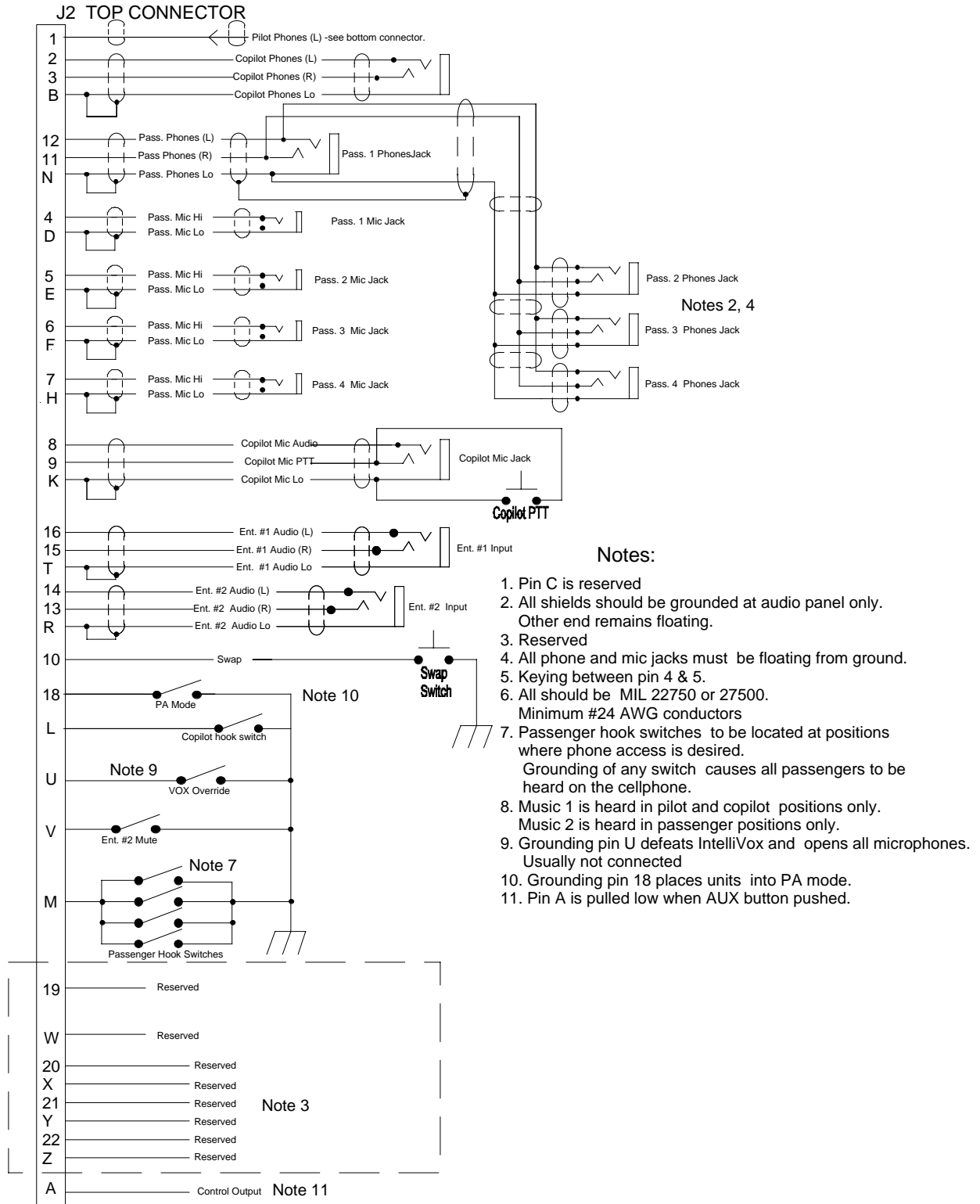
Figure 4-3 Tray Assembly Drawing

Appendix B Bottom Connector Interconnect



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Appendix C Top Connector Interconnect



- Notes:**
1. Pin C is reserved
 2. All shields should be grounded at audio panel only. Other end remains floating.
 3. Reserved
 4. All phone and mic jacks must be floating from ground.
 5. Keying between pin 4 & 5.
 6. All should be MIL 22750 or 27500. Minimum #24 AWG conductors
 7. Passenger hook switches to be located at positions where phone access is desired. Grounding of any switch causes all passengers to be heard on the cellphone.
 8. Music 1 is heard in pilot and copilot positions only. Music 2 is heard in passenger positions only.
 9. Grounding pin U defeats IntelliVox and opens all microphones. Usually not connected
 10. Grounding pin 18 places units into PA mode.
 11. Pin A is pulled low when AUX button pushed.

Appendix D- Instructions for FAA Form 337 and Continuing Airworthiness

7.1 Instructions for FAA Form 337

One method of airworthiness approval is through an FAA Form 337, *Major Repair and Alteration (Airframe, Powerplant, Propeller, or Appliance)* In the case of the KMA 28, you may use the following text as a guide.

Installed audio selector and 6-place intercom, Honeywell KMA 28, part number 066-01176- (XXXX) in (*location*) at station _____. Installed per AC43.13-2, Chapter 2, paragraph 23 (Instrument Panel Mounting). Installed per Honeywell *Installation Operators Manual* p/n 006-10565- (____), revision (), dated ().

This unit is FAA-Approved under TSO C50c for audio amplifiers, TSO C35d for Marker Beacon Receivers, and meets appropriate environmental qualifications outlined in RTCA DO-160B as appropriate or this aircraft.

Interface to existing aircraft radios in accordance with installation manual and in compliance with practices listed in AC43.13-2, Chapter 2. All wires are Mil-Spec 22759 or 27500. Connection to aircraft dimmer bus is _____. Power is supplied to the unit through a ___A circuit breaker (*type and part number*), and total electrical load does not exceed _____% of the electrical system capacity with the KMA 28 added.

Aircraft equipment list, weights and balance amended. Compass compensation checked. A copy of the operation instructions, contained in Honeywell document 006-10565-(____), revision (), dated (), is placed in the aircraft records. All work accomplished listed on Work Order _____.

Instructions for Continuing Airworthiness,

Sample ICA Checklist for KMA28:

Section	Item	Information
1	Introduction	Installation of audio control panel with integrated marker beacon receiver and intercommunications system.
2	Description	Installation as described in manufacturer's installation manual referenced on FAA Form 337, including interface with other avionics audio as required.
3	Controls	See installation and operator's guide referenced on FAA Form 337.
4	Servicing	None Required
5	Maintenance Instructions	On Condition, no special instructions
6	Troubleshooting	In the event of a unit problem, place the unit into "OFF/EMG" mode. This allows pilot communications using COM 1. Follow checkout instructions in the installation manual referenced on the FAA Form 337. For a specific unit fault, contact the manufacturer at 1-800-257-0726 for special instructions.
7	Removal and replacement information	<u>Removal:</u> Using a 3/32" Allen-head wrench, carefully unscrew the locking screw located in the center of the unit. While turning the wrench CCW, gently pull on the EDGES of the bezel until the unit is free from the mounting tray. <u>Installation:</u> Engage the locking screw at the back. Turn the locking screw CW, while applying slight pressure to the edges of the bezel. Do not over tighten!
8	Diagrams	Not applicable
9	Special Inspection Requirements	Not Applicable
10	Protective Treatments	Not Applicable
11	Structural Data	Not Applicable
12	Special Tools	None
13	Not Applicable	Not Applicable
14	Recommended Overhaul Periods	None
15	Airworthiness Limitations	Not Applicable
16	Revision	To be determined by installer

Appendix E RTCA DO160C (EUROCAE ED-14) Environmental Qualification Form

Audio Selector Panel/Intercom/Marker Beacon Receiver

Part Number: 7000M-S

FAA TSO Number: C50c, C35d Class A, JTSO 2C35d and JTSO C50c

Manufacturer: PS Engineering Incorporated 9800 Martel Road Lenoir City TN 37772

Conditions	Section	Conducted Tests
Temperature and Altitude	4.0	Equipment tested to CAT A1 & D1
Low Temperature	4.5.1	-55° C Storage, -15°C Low Operating (A1)
High Temperature	4.5.2	+85°C Storage, +70°C High Operating
In-flight Loss of Cooling	4.5.4	Not Applicable, no cooling required
Altitude	4.6.1	50,000' unpressurized
Decompression	4.6.2	Not Applicable
Overpressure	4.6.3	Not Applicable
Temperature variation	5.2	Equipment tested to Category C
Humidity	6.0	Equipment tested to Category A
Shock	7.0	Equipment tested to Operational test only
Operational	7.2	Equipment tested to Operational test only
Crash Safety	7.3	Equipment tested to Operational test only
Vibration	8.0	Equipment tested to Category M & N
Explosion	9.0	Category X, not tested
Waterproofness	10.0	Category X, not tested
Fluids Susceptibility	11.0	Category X, not tested
Sand and Dust	12.0	Category X, not tested
Fungus	13.0	Category X, not tested
Salt Spray	14.0	Category X, not tested
Magnetic Effect	15.0	Equipment tested to Category Z
Power input	16.0	Equipment tested to Category B
Voltage Spike	17.0	Equipment tested to Category B
Audio Frequency Susceptibility	18.0	Equipment tested to Category B
Induced Frequency Susceptibility	19.0	Equipment tested to Category B
Radio Frequency Susceptibility	20.0	Equipment tested to Category T
Radio Frequency Emission	21.0	Equipment tested to Category B
Lightning Induced Transient Susceptibility	22.0	Equipment tested to Category K
Lightning Direct Effects	23.0	Category X, not tested
Icing	24.0	Category X, not tested